

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

BMP2014 – MATHEMATICAL PROGRAMMING (All sections / Groups)

19 OCTOBER 2018
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of THREE (3) printed pages excluding cover page.
2. Answer ALL FOUR (4) questions.
3. Please write all your answers in the Answer Booklet provided.

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QUESTION 1 (25 MARKS)

(a) Samy's company manufactures two types of table, models X and Y. The production of a model X table requires a capital expenditure of RM6 and 2 hours of labour. The production of a model Y table requires a capital expenditure of RM4 and 5 hours of labour. The company has RM240 of capital and 100 hours of labour available for the production of the two models. A model X table contributes a profit of RM30 while model Y contributes RM40.

Formulate the Linear Programming problem for Samy's company and apply the **graphical method** to solve the model. Use the corner points method to verify and interpret your optimal solution.

(15 marks)

(b) Consider the following Linear Programming model:

$$\text{Maximize } Z = 500x_1 + 440x_2$$

Subject to:

$$\begin{aligned} x_1 &\leq 150 \\ x_2 &\leq 90 \\ 20x_1 + 10x_2 &\leq 500 \\ x_1, x_2 &\geq 0 \end{aligned}$$

and its optimal table is provided as below:

Row	Z	x_1	x_2	S_1	S_2	S_3	RHS
0	1	880	440	39	0	44	22 000
1	0	1	0	1.1	0	0	150
2	0	-2	0	0	1	-0.1	40
3	0	2	1	-0.7	0	0.1	50

Find the dual for above model and state the duality optimal solution. What is the dual's objective function?

(10 marks)

Continued...

QUESTION 2 (25 MARKS)

Find an optimal solution using **Two Phase simplex method** for the following Linear Programming problem:

$$\text{Minimize } C = -2x_1 + 4x_2 + 7x_3 + x_4 + 5x_5$$

Subject to:

$$-x_1 + x_2 + 2x_3 + x_4 + 2x_5 = 7$$

$$-x_1 + 2x_2 + 3x_3 + x_4 + x_5 = 6$$

$$-x_1 + x_2 + x_3 + 2x_4 + x_5 = 4$$

$$x_1, x_2, x_3, x_4, x_5 \geq 0$$

QUESTION 3 (25 MARKS)

(a) Determine whether the function f below is a convex, or a concave function or neither with a given set S :

$$f(x_1, x_2, x_3) = -x_1^2 - x_2^2 - 2x_3^2 + 0.5x_1x_2, \quad S = \mathbb{R}^3$$

(5 marks)

(b) Find the optimal solution to the following problem using **Golden Section Search**:

$$\begin{array}{ll} \text{Maximize} & Z = x - e^x \\ \text{subject to:} & -1 \leq x \leq 3 \end{array}$$

within an interval of 0.6.

(20 marks)

Continued...

QUESTION 4 (25 MARKS)

(a) Carolina Airlines, a small commuter airline in North Carolina, has six flight attendants whom it wants to assign to six monthly flight schedules in a way that will minimize the number of nights they will be away from their homes. The number of nights each attendant must be away from home for each schedule are given in the following table. Identify the optimal assignments that will minimize the total number of nights which, the attendants will be away from home:

Attendant	Schedule					
	A	B	C	D	E	F
1	7	4	5	10	5	7
2	4	5	4	12	7	5
3	9	9	10	7	10	7
4	11	6	7	5	9	9
5	5	8	5	10	7	5
6	10	12	10	9	9	9

(5 marks)

(b) A logistics specialist for Wiethoff Inc. must distribute sub-assemblies from three factories to three assembly plants. The transportation cost per unit in dollar sign (\$) from each factory to each plant is shown in the following table:

Factory	Assembly Plant			Supply
	1	2	3	
A	40	10	20	800
B	15	20	10	500
C	20	25	30	600
Demand	1050	500	650	

Obtain a basic feasible solution using **Northwest Corner method**. Then, apply the **transportation Simplex method** to find the least-cost distribution system.

(20 marks)

End of Questions.